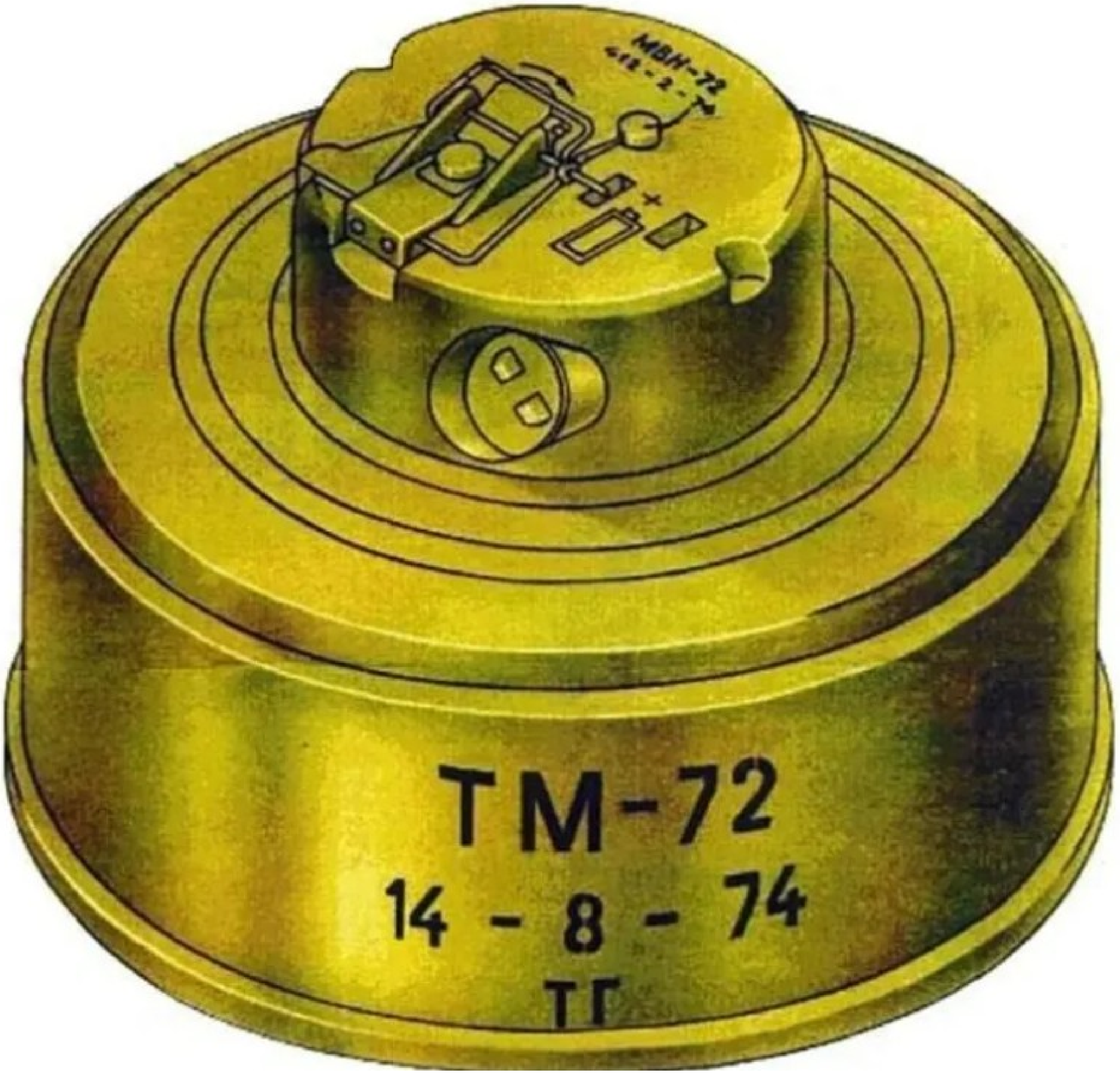
Anti-Tank Mine TM-72 And Mine Fuze MVN-72



PURPOSE

The TM-72 anti-tank mine is designed to destroy enemy tanks, self-propelled missile and artillery units, armored personnel carriers and vehicles.

Main tactical and technical characteristics of the mine

Mine type: Cumulative

Fuse model, Non-contact: MVN-72

Overall dimensions:

Diameter 250*mm*

Height with fuse 128*mm*

The mass of the mine with the fuze is 13.25lbs

Mass of explosive charge (TG-40) 5.5l*bs*

Case material: Steel

Damaging effect: Provides damage to tank units, penetration of tracks and defeat of the crew

Armor penetration: Penetrates armor up to 100*mm* thick from a distance of *8-20 inches*; hole diameter is 50–60*mm*

Installation method: On the ground (into the ground) manually and using a chute from a vehicle

Guaranteed shelf life is 10 years

Mine Fuse MVN-72

The MVN-72 fuze is designed to detonate TM-72 anti-tank mines and TM-62 series mines when exposed to the magnetic field of a tank, armored personnel carrier or vehicle.

Main tactical and technical characteristics of the fuze

Type: Non-contact, magnetic

Operating principle: Triggered by the magnetic field of a tank, armored personnel carrier or car

Overall dimensions:

Diameter 125*mm*

Height 96*mm*

Weight *2.5lbs*

Battery Element: PMC-U-48G (KBU-1.5)

Warranty period of combat operation: [1] 1 month

Arming time: 30-120*sec*

Temperature range of operation from -40 °F to +122 °F

Triggering point: Under the projection of a tank, armored personnel carrier, car at speeds of more than *3-5mph*

Warranty period of storage (without power source) 5 years

The guaranteed shelf life of power sources is 2 years.

MINE DEVICE

The TM-72 mine equipped with the MVN-72 fuze is shown in Fig. 1. The TM-72 mine (Fig. 2) has a metal body (*1)*, a fuze well (*2)* with a thread for screwing in the fuze, closed with a plug (*3). A rubber gasket (4)* is provided to seal the connection between the mine and the fuze. The cumulative charge of explosives (TG-40) (*5)* has an annular cumulative recess with a steel lining (*6).* To ensure better formation of the cumulative jet, the charge has an inert lens consisting of a foam insert (*7)* and a metal washer (*8). A tetryl block (9)* weighing *0.75oz* serves as a booster. The bottom of the mine (*10)* is connected to the body by a seal. There is a port on the side of the body through which the explosive charge is poured. The port is closed with a plug. The side surface of the body is marked with the following: mine code, manufacturer's brand, batch number, year of manufacture and equipment code. There is a removable handle made of canvas for carrying the mine (Fig. 1).

The design and operating principle of the fuse

The MVN-72 fuze (Fig. 3) consists of a housing, inside which a non-contact reaction device, elements of the firing chain and a clockwork safety mechanism are mounted.

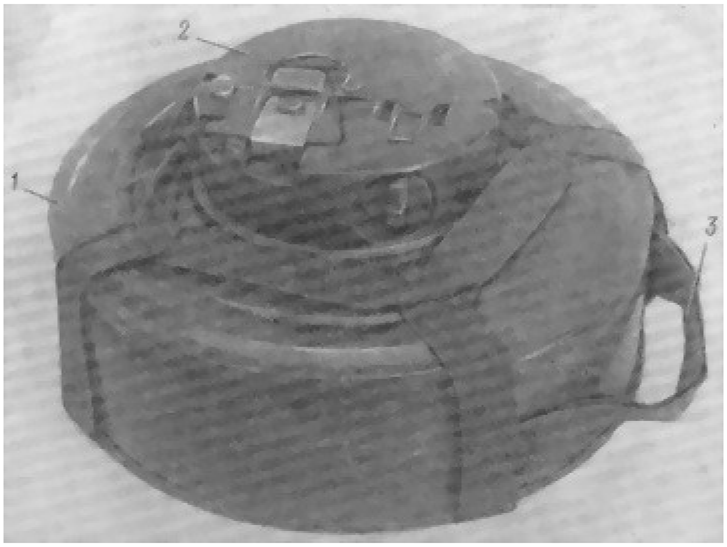


Fig. 1. Anti-tank mine TM-72, equipped with a fuze MVN-72, in transport position (general view):

1 — TM-72 mine; *2* — MVN-72 fuze; *3* — carrying handle

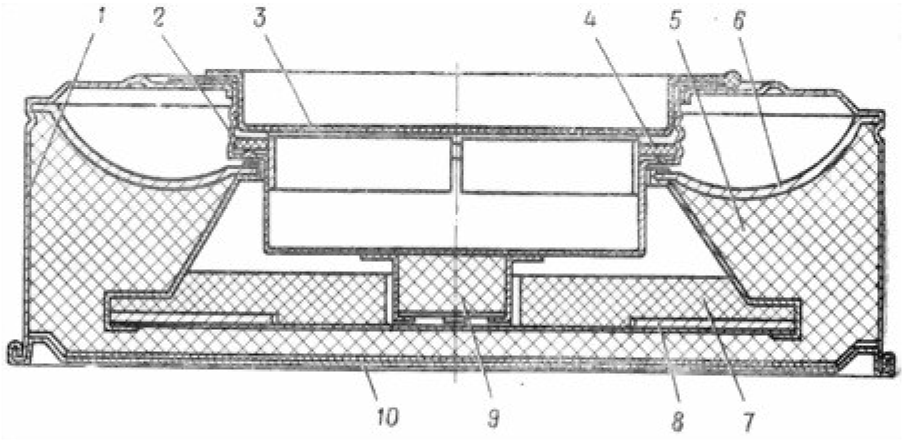
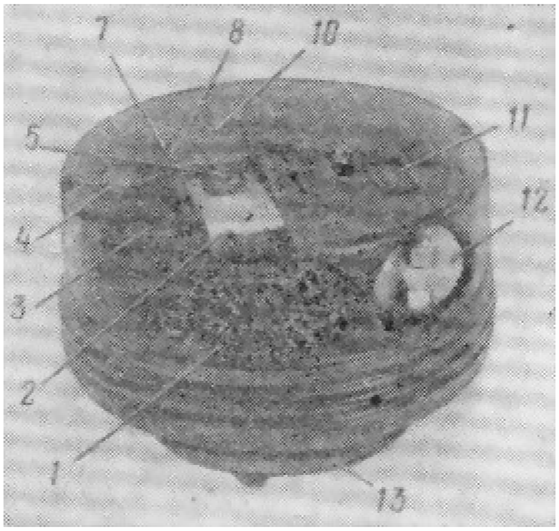


Fig. 2. Anti-tank mine TM-72 without fuze (section):

1 — body; *2* — fuze well; *3* — plug; *4* — gasket; *5* — explosive charge; *6* — cumulative recess lining; *7* — insert; *8* — washer; *9* — booster; *10* — bottom

The body is made of aluminum alloy. On top of the fuse body there is a shaped recess in which the button (*14)* for starting the clock safety mechanism and the folding detonator handle (*3)* are located. The button is painted red and is covered from above by a folding detonator handle, protecting it from accidental activation. The folding handle is hinged attached to the rod of the clock mechanism. Turning the handle all the way in the direction of arrow (*10)* simultaneously winds the clock mechanism spring and transfers the fuse from the combat position to the transport position. On the folding detonator handle there are two ribs with holes for inserting the wire safety pin (*8)* and a cylindrical protrusion for articulation with the safety pin.



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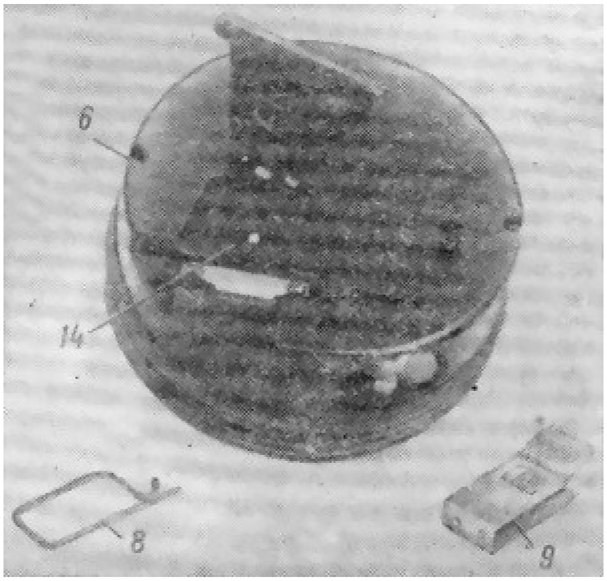

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Fig. 3. Mine fuze MVN-72:

a — general view of the fuze in the transport position; *b* — view of the fuze from above with the safety pin removed, the folding handle raised and the button pressed; *1* — body; *2* — safety clip; *3* — folding handle; *4* — seal; *5* — protrusion on the folding handle; *6* — key sockets; *7* — ribs with holes for the pin; *8* — safety pin; *9* — spring clip of the safety pin; *10* — arrow indicating the direction of rotation of the folding handle when winding the fuze clockwork mechanism; *11* — diagram of the location of the KBU-1.5 element; *12* — plug of the socket for the battery; *13* — cap; *14* — arming button

The safety clip (*2)* is made in the form of a rigid steel plate with a cutout, to which a spring latch (*9)* with a hole is riveted. The safety clip is installed under the button, and the latch of the pin with a hole is put on the projection (*5)*. Additionally, the safety clip is attached to the fuze using a pin (*8)* and sealed. In this position, the button of the clock mechanism is reliably held from being pressed, and the safety clip is held from being removed accidentally, which ensures the transport (safe) position of the fuze.

On the side of the body there is a socket for the battery, closed with a threaded plug (*12)*. On the plug there is a slot for a special key. The battery is the KBU-1.5 element. The "+" sign shows the position of the central contact of the element.

The fuse body has an external thread for connection with the mine. When arming the mines, the fuses are screwed in by hand and tightened with a standard (for the TM-62 series of mines) wrench, for which there are two sockets (*6)* on the fuse body and two projections on the key. The general appearance of the standard wrench and special key is shown in Fig. 4.

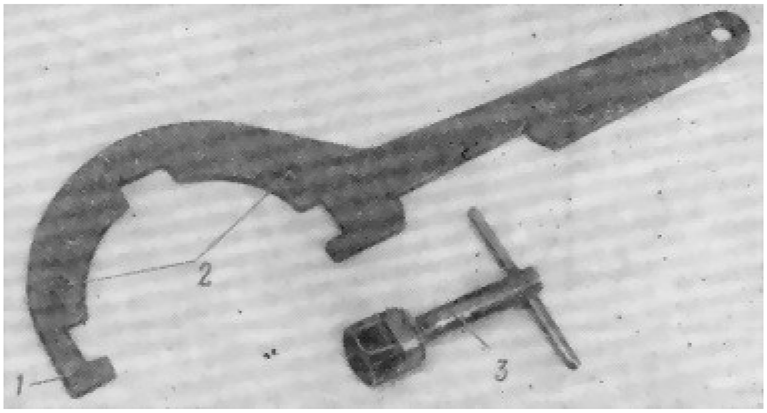


Fig. 4. Keys:

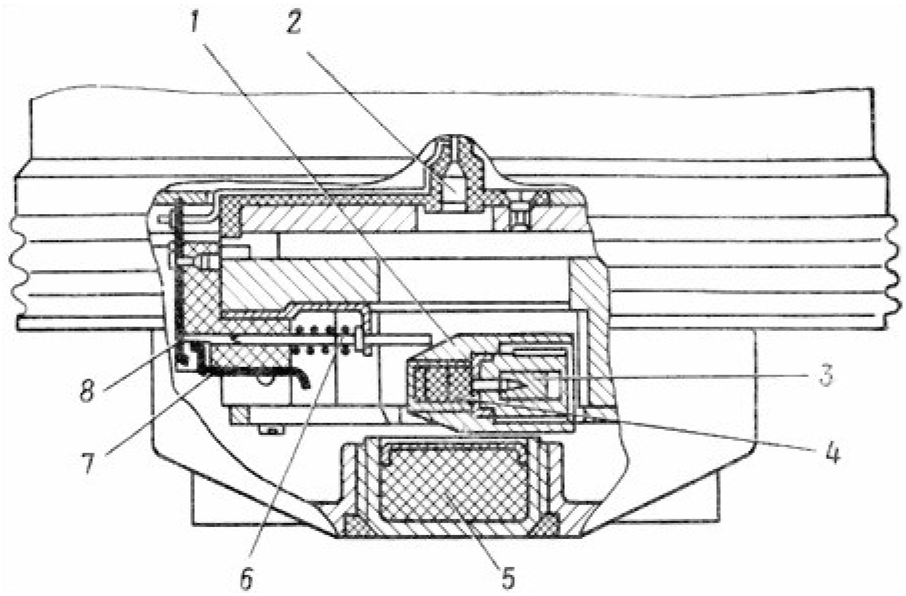
1 - wrench for screwing the fuze into the mine; *2* - protrusions on the key; *3* - key for unscrewing and screwing the plug of the socket for the battery

At the bottom of the fuze there is a cap, in the lower part of which a transfer charge is fixed - a tetryl block weighing 0.35oz.

The fuse cover is marked with the fuse code, manufacturer's brand, batch number and year of manufacture.

The clock safety mechanism ensures that the fuse is transferred from the transport position to the combat position 30-120 *seconds* after the button is pressed.

The interaction of the fuse elements when transferred to the combat position is shown in Fig. 5. In the transport position (Fig. 5, a), the electronic circuit of the non-contact fuse of the reacting element is disconnected from the battery and the fuse firing circuit is broken (electric igniter NH-PCH (*2)* - pyrotechnic retarder (*3)* and detonator cap TAT-1-T (*4)* - transfer charge (*5)*), since the engine (*1)*, in the body of which the pyrotechnic retarder and detonator cap are located, is in a horizontal position.



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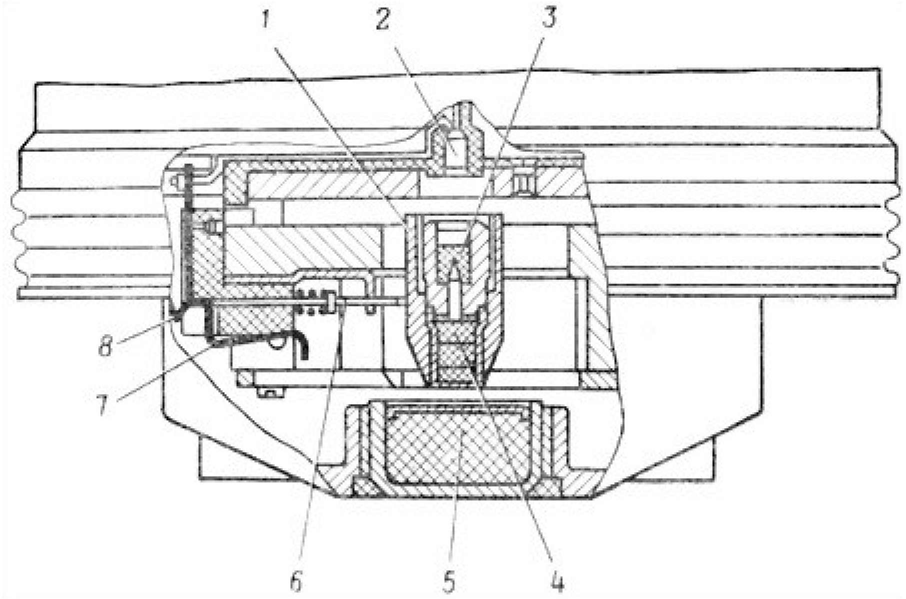

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Fig. 5. Detonator MVN-72:

a — safe (transport) position; *b* — combat position; *1* — rotary engine; *2* — electric igniter NH-PCh; *3* — pyrotechnic retarder; *4* — detonator cap TAT-1-T; *5* — transfer charge; *6* — contact rod; *7* and *8* — contacts

When the fuse is set to the combat position (pressing the button), the safety mechanism starts to operate. After 30-120 *seconds*, the engine (*1)* (Fig. 5, b), fixed on two half-axles, turns to a vertical position. As a result of the engine turning, the pyrotechnic retarder (*3)* is set against the electric igniter (*2)*, and the detonator cap (*4)* is set against the transfer charge (*5)*, as a result of which the fuse's firing circuit is closed.

When turning, engine (*1)* moves spring-loaded contact rod (*6)*, which closes contacts (*7)* and (*8)* with its sharp end, and a battery and electric igniter (*2)* are connected to the electronic circuit of the fuse.

When the fuse is moved to the safe (transport) position, simultaneously with the winding of the clockwork spring, the engine (*1)* turns to the horizontal position. The rod (*6)*, under the action of the spring, moves away from the contacts (*7)* and (*8)*, disconnecting the electric igniter (*2)* and the battery from the fuse's electronic circuit.

Turning engine (*1)* to a horizontal position ensures that the firing chain is broken.

A non-contact magnetic-type response device ensures the fuse is triggered when exposed to a magnetic field from a tank, armored personnel carrier, or automobile. The functional connection of the main elements of the fuse's electronic circuit is shown in the block diagram (Fig. 6).

Units *1–6* constitute a non-contact responsive device. Battery (*7)* is connected to voltage converter (*8)* by a clock safety mechanism (*9)*.

The voltage converter is designed to convert the low-voltage voltage of the battery of 1.5 *V* to 15 *V*. The voltage of 15 *V* is intended to supply the combat capacitor and the electronic circuit of the non-contact responsive device.

Sensor (*1)* is an induction coil with a core and is designed to convert the magnetic field of a moving target (tank, armored personnel carrier, car) into an EMF signal.

Filter (*2)* suppresses interference that produces a high-frequency signal and outputs a useful signal from the sensor to modulator (*3)*.

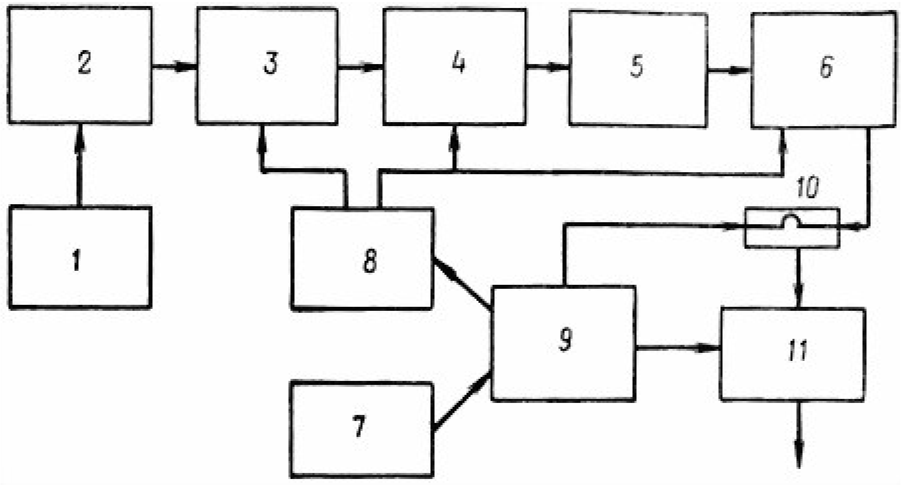


Fig. 6. Block diagram of the MVN-72 fuze:

1 — sensor; *2* — filter; *3* — modulator; *4* — amplifier; *5* — pulse counter; *6* — actuator; *7* — battery; *8* — voltage converter; *9* — safety clock mechanism; *10* — electric igniter; *11* — elements of the fire circuit

The modulator converts the low-frequency useful signal of the sensor into a pulse signal with a pulse repetition frequency of about 200 *Hz*. The converted signal is fed to the amplifier (*4)*, and after amplification, to the pulse counter (*5)*.

The pulse counter provides a signal to trigger the actuator when at least three pulses are received, which eliminates triggering due to the impact of random single pulses.

The actuator cascade (*6)*, upon receiving a signal, closes the firing circuit of the electric igniter (*10)*. The electric igniter, when triggered, causes the ignition of the pyrotechnic retarder and after 0.2 *seconds* the detonator cap and transfer charge, which are part of the firing circuit (*11)* of the fuse, explode.

The transfer charge transmits the detonation to the intermediate detonator of the mine, which causes the explosion of the cumulative charge.

The guaranteed period for the combat operation of the fuze is 1 month.

The fuze can remain operational in a minefield, while in a combat position, for up to 6 months or more, which must be taken into account when removing (disarming) mines equipped with MVN-72 fuzes.

SAFETY MEASURES

1. Persons who know the structure and operating principle of the fuze and mines and who have received instructions on safety measures and rules for handling fuzes and mines are allowed to equip and install TM-72 mines and the TM-62 series with MVN-72 fuzes.

2. When handling fuzes and mines, it is necessary to be guided by this Manual and the general provisions of the Manual on the Material Part of Engineering Weapons. Mining and Mine-Clearing Equipment (books one and two). Engineering Ammunition (Voenizdat, 1963).

3. When handling the MVN-72 fuze, it is necessary to always remember that the fuze with a battery, when set to the combat position, FUNCTIONS:

— **from the impact of the magnetic field of ferromagnetic objects** moving near the fuze, including small objects (weapons, shovel, helmet, probe, shell fragments, pins, etc.);

- **from its movement in the Earth's magnetic field**.

The fuse can also be triggered by a magnetic field created by the flow of electrical currents near the fuze.

4. Storage and transportation of fuzes, equipping fuzes with a battery, equipping mines with fuzes, transportation of mines equipped with fuzes, and their installation are carried out only when the fuze is in the transport position (with safety pins).

5. Equipping fuzes with batteries and equipping mines with fuzes is carried out by the troops, at the mine dump, when preparing mines for installation.

6. Storage in warehouses and transportation of MVN-72 fuzes and mines by rail is carried out separately, in the factory packaging. Temporary storage of TM-72 and TM-62 series mines equipped with MVN-72 fuzes (in the transport position) in mine dumps and their transportation by road in packaging for mines, in containers and minelayers (TM-62 series mines) is permitted.

7. Mines with MVN-72 fuzes must be installed at distances of:

— from operating high-voltage transmission lines — not closer than 200*m*;

— from operating electrified railways — not closer than 25*m*;

— from operating powerful radio and radar stations — no closer than 200*m*.

8. Removing the safety pin and pressing the MVN-72 arming button is done manually and only after the mine has been installed on the ground.

9. The final camouflage of the mine and withdrawal from it should be carried out no more than 30 *seconds* after the button is pressed.

10. IT IS PROHIBITED:

- remove the safety pin and press the button until the mine is planted on the ground;

- store and transport fuzes and mines without packaging and with safety pins removed;

- touch and move the mine after 30 seconds have passed since pressing the arming button;

- **bring any ferromagnetic objects close to a mine that has been brought into combat position or remove them from it;**

- find mines that have been switched to combat position using probes (not even steel ones);

- defuse (remove) mines installed with a camouflaged fuze.

PREPARING MINES FOR INSTALLATION

Preparing mines for installation consists of equipping fuzes with batteries and equipping mines with fuzes.

To equip the fuse with a battery, it is necessary:

- open the packaging with the batteries and check the markings to make sure that they are suitable for use according to their shelf life (KBU-1.5 elements are considered suitable for use if they have at least two months left before the expiration of their warranty shelf life, and do not have any electrolyte leaks or wall swelling);
- open the crate with the fuzes and remove the keys and fuzes from it (one at a time as they are loaded);
- clean the central contact and the bottom of the element;
- use a key to unscrew the plug that closes the socket for the battery;
- insert the battery into the socket in the fuze;
- First tighten the cap by hand and then with a wrench until it stops.

To equip a mine with a fuze, it is necessary:

- open the crate with the mines and remove the mine from it;
- remove the transport plug from the mine that closes the fuse well;
- make sure that the rubber gasket is in the correct position in the mine (if the gasket has shifted, put it back in place);
- screw the fuze into the mine by hand and tighten it with a wrench;
- place the mine in a box (container, minelayer).

To prepare mines for installation by a 7-person sapper squad, the following work organization is recommended:

- 2x people open the boxes with fuzes and equip the fuzes with batteries;
- 2x people open boxes with mines and equip the mines with fuzes;
- 2x people carry boxes with mines to the loading area and carry loaded mines to the loading platform (into a vehicle or minelayer);
- 1x person (squad leader) supervises the work of the squad, monitors the correct installation of batteries and brings the fuzes equipped with batteries to the mine loading site.

INSTALLING MINEFIELDS

Minefields are laid using TM-72 and TM-62 series mines with MVN-72 fuzes:

— three- and four-row with a mining space of 8*m*;

— four-row with a mining space of 11 and 12*m*;

— double-row with a mining space of 5.5*m* (when installing TM-62 series mines in the ground using the GMZ-2 minelayer).

The distance between rows of mines in a minefield is 10–40*m*.

Standards for the installation of minefields are given in Appendix 1.

The probability of tank damage in minefields is given in Appendix 2.

Installation of minefields from TM-72 mines

Minefields from TM-72 mines are installed manually and from a vehicle by laying. It is allowed to install mines from a vehicle using a chute.

TM-72 mines are installed:

— on the ground surface (on snow in winter);

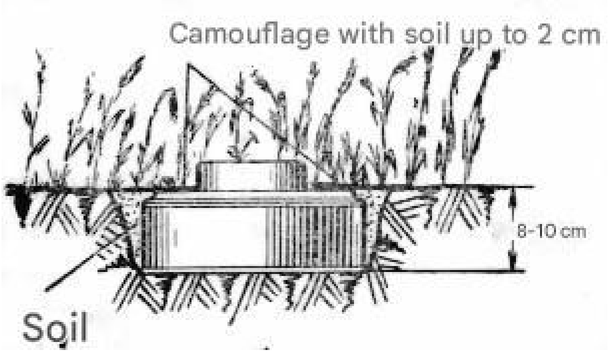
— into the ground flush with the ground surface;

— in snow with camouflage by a layer of snow up to 6 inches.

Mines installed on the ground are camouflaged with improvised materials (grass, leaves, etc.) or a soil layer up to 1 inch. A camouflage soil layer of more than 1 inch worsens the formation of a cumulative jet. Camouflage with a snow layer of up to 6 inches has little effect on armor penetration.

Mines installed in the ground (snow) are more resistant to the impact of the shock wave of a nuclear explosion and a demining charge.

Installation options for the TM-72 mine are shown in Fig. 7.



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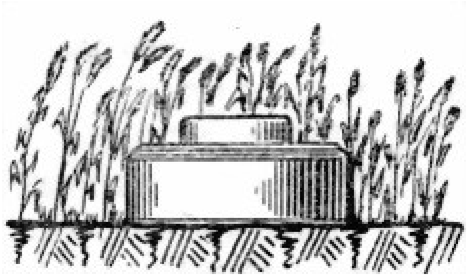

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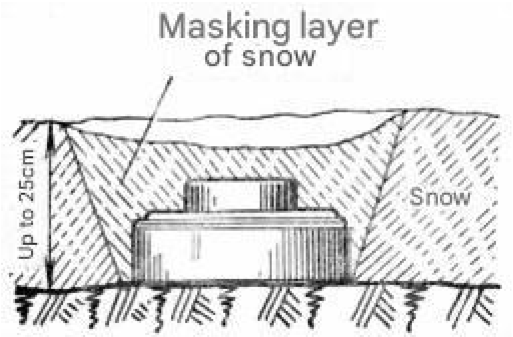

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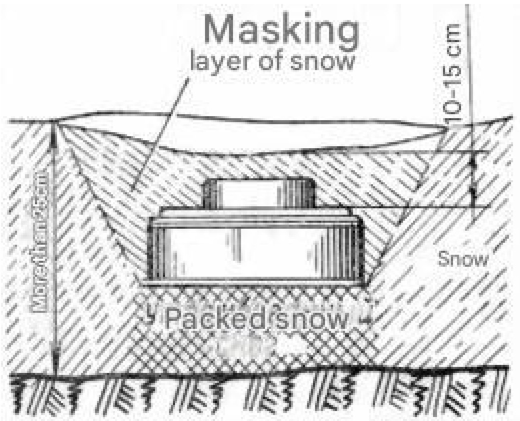

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Fig. 7. Installation options for the TM-72 mine:

a — into the ground without camouflage or with the mine body camouflaged with soil up to 1 inch; b — onto the ground surface; *c* — into snow with a cover thickness of up to 10 inches*; d* — into snow with a cover thickness of more than *10 inches*

To install a mine in the ground manually, you need to:

- dig a hole *3-4 inches* deep, the size of the mine body;

- install a mine in a hole, and fill the void around the mine with soil on the side; disguise excess soil removed when digging the hole in depressions in the terrain;

- camouflage the mine by bending down grass, leaves, sprinkling it with soil in a layer of up to 1 inch, dust or other local material to match the background of the surrounding area;

— set the mine detonator to the combat position.

To set the mine fuze to the combat position, it is necessary:

- remove the seal and wire pin;

- lift the safety pin latch so that it disengages from the protrusion on the folding detonator handle and remove the safety pin;

- lift the folding detonator handle to a vertical position;

- press the red button;

- release the folding handle.

Safety clips and wire pins are handed over to the squad leader.

The installation of a minefield from vehicles by dropping or using chutes is carried out by a platoon of sappers. Mines prepared for installation are loaded onto three vehicles. Boxes with mines are placed in the body along the sides in two rows by height. A passage is left in the middle along the body. One section is assigned to service each vehicle.

Minefields can be laid by dropping mines from a vehicle or using chutes manufactured by the military. The tray must ensure the movement of mines along an inclined chute without turning over or rolling on the ground.

To maintain the mining step, a piece of black and white tape of a length equal to the specified mining step is attached to the rear side of the vehicle. When mining, the vehicles move in a step (like the minelayers). Each vehicle lays one row of mines.

Mining when installing mines on the ground surface is carried out as follows:

- the squad leader is in the vehicle cabin and directs its movement;

- 3x people are in the back of the vehicle; one of them, starting from the front side, opens the boxes with mines and as they are cleared of mines, moves the empty boxes of the upper row into the passage and onto the boxes of the lower row cleared of mines; 2x people remove the mines from the boxes, bring them two at a time to a given side and alternately drop them on the ground right side up through the rear side of the vehicle or lower them down the inclined chute of the tray; to obtain a given step, the next mine is dropped at the moment when the end of the black and white tape passes the previous mine;

- 2x people move behind the vehicle at a distance of 20–25*m*, one of them, if necessary (in case of overturning and unstable position), corrects the position of the mine, removes the seal, wire pin and safety clip, the second presses the button and camouflages the mines.

The platoon commander and three people (one from each squad) record the minefield.

If time permits, TM-72 mines are installed in the ground. In this case, mines are laid out from vehicles in the same way as described above. Two people are assigned to each vehicle (in the back) to lay out mines (they then perform the task of installing mines in the ground after the laying is completed). Three people from each section, moving behind the vehicle in a rolling motion, install the laid mines in the ground manually. One person, moving last, removes the safety pins, camouflages the mines with soil, grass, leaves, and presses the arming buttons.

After the minefield is laid out, one person from each squad is assigned to the platoon commander to record the minefield, and the squad commanders, after the minefield is laid out, supervise the relocation of the mines into the ground.

When installing mines from trucks, a strict sequence of switching the fuzes to the combat position is observed. *The sapper, who presses the mine buttons and masks the mines, moves in the rear at a distance of at least 12m behind all the crews participating in the installation.*

The installation of a minefield manually by a line crew is also carried out by a platoon of sappers in accordance with the requirements of the Manual for the Installation and Overcoming of Engineering Obstacles, Art. 43–47 (Voenizdat, 1966) and *taking into account the special requirement for the safety of installing mines with a non-contact fuze MVN-72*, which is that *approach to a mine installed in a combat position must be excluded*.

When laying mines, one squad brings the mines from the mine dump to the starting line, and two squads install them. Each sapper performs all operations to install the mine.

When installing a three-row minefield, each sapper carries and installs three mines at a time. The mines are brought to the initial line and laid out in threes at intervals of 8*m* (about 10–11 steps).

On command from the platoon commander, the sappers stand on the starting line, take three mines each and, moving forward from the starting line, lay out the mines at each approach, starting from the back row to the first (the rows are counted from the enemy). The installation of mines and their transfer to the combat position is carried out, starting from the first row, during the return movement. The transfer of mines to the combat position (pressing buttons) in each row and the withdrawal from the installed mines is carried out by all sappers simultaneously, on command from the platoon commander.

When installing a four-row minefield, each sapper carries and installs four mines at a time. Mines are laid out on the initial line in groups of four at intervals of 11–12*m* (about 14–15 steps).

In conditions of limited visibility and in the presence of high vegetation in summer, when finding the laid mines is difficult, the following mining order is recommended. On the commands of the platoon commander, the sappers, moving from the initial line, lay mines first in the fourth, and then in the third, second and first rows. The sappers exit the minefield after laying mines in the first row by moving forward 5-10 steps and then bypassing the laid mines towards the flank in which the mining is being carried out.

The installation of minefields manually along the mine cord at night is carried out by a detachment of sappers. Four-row minefields are installed with a step of 8 and 11*m. During installation, a rod with a reference sign of 4 and 5.5m* in length, respectively, is used. The rod is moved between the successive cords twice to obtain a step of 8 or 11*m.*

To prevent sappers from crawling near mines set in a combat position and to ensure safety, mining is carried out in the following order:

— The first soldier of each calculation with two mines crawls forward to the reference mark until the cord is completely unwound; having secured the end of the cord and leaving the mines near the end of the cord, moves the rod with the reference mark twice; returns to the left mines and sets the first mine at a distance of 18 inches from the end of the cord; with the second mine, returns to the mark with one ring and, turning to face the enemy, sets it to the left of the cord at a distance of two outstretched arms;

— Soldier 2, after fully unwinding the cord with two mines, crawls forward to the mark with three rings, where he leaves one of the mines, and with the other mine moves to the mark with two rings and places it to the right of the cord at a distance of two outstretched arms; having placed the mine and without switching it to the combat position, he waits for Soldier 1 to return past him, after which he removes the safety pin, presses the button and camouflages the mine; following Soldier 1, he returns to the previously left mine and, turning to face the enemy, places it at a distance of two intervals (two outstretched arms) from the cord to the right (when mining towards the right flank) or to the left (when mining towards the left flank); after placing the second mine, he returns to the trench.

Installation of minefields from TM-62 series mines with MVN-72 fuzes

Minefields of TM-62 series mines with MVN-72 fuzes are laid by PMZ-4 towed minelayers and GMZ-2 tracked minelayers. The specified mechanization means are used only to lay mines in the ground or on the ground surface. The mine fuzes are switched to the combat position only manually at the place of their installation.

Minefields of TM-62 series mines with MVN-72 fuzes can also be installed from vehicles by dropping or using trays and manually. TM-62 series mines can be installed in the ground (snow) with camouflage and on the ground surface. Mines are installed in various conditions in the same way as mines with pressure fuzes. When installing TM-62 series mines in the ground (snow) manually, they are camouflaged without forming a mound.

The installation of a minefield using PMZ-4 towed minelayers and GMZ-2 tracked minelayers is carried out in accordance with the instructions for their operation and the Guide to the Construction and Overcoming of Engineering Obstacles (Voenizdat, 1966).

Mines equipped with MVN-72 fuzes are loaded into PMZ-4 containers (GMZ-2 cassettes) with safety pins. Seals, wire pins and mine handles are removed before loading.

When laying mines using the PMZ-4 to obtain a step of 8 and 11*m*, the mines are fed into the dispensing tray through one interval of the dispensing chain, and when installing with a step of 12*m* - through two intervals.

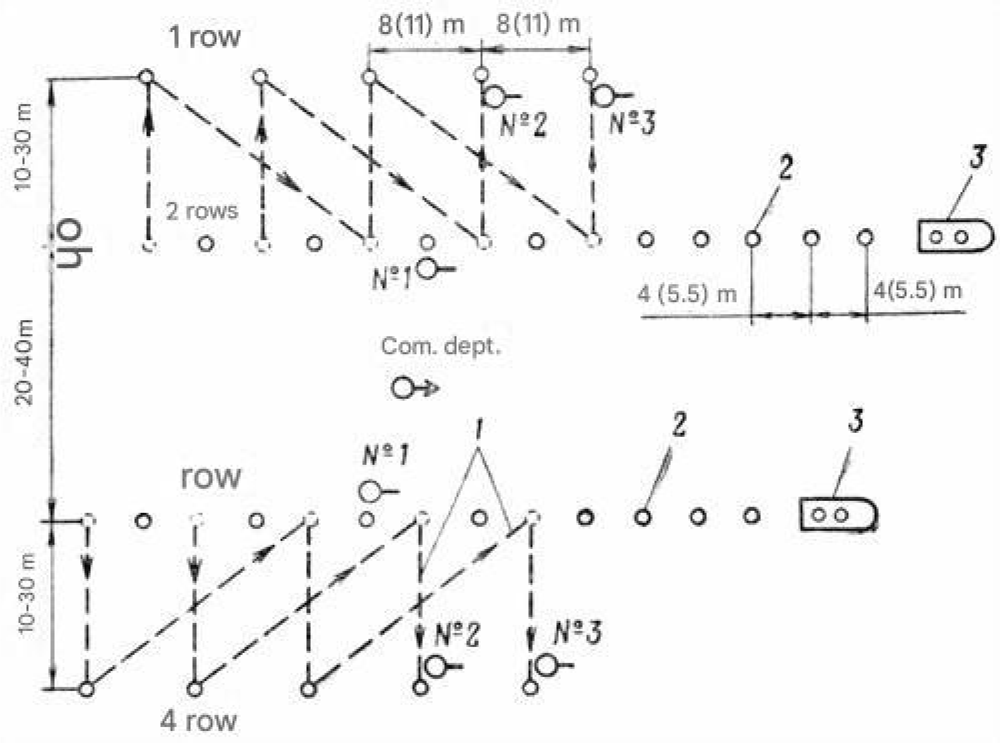

Fig. 8. Actions of the sapper squad when distributing mines laid by mine layers and transferring them to a combat position:

No. 1 - calculations that put the mines remaining in rows 2 and 3 into combat position;

No. 2 and 3 - crews that distribute mines to rows 1 and 4 and transfer them to a combat position;

1 - routes of movement of calculations; *2* - mines; *3* - minelayers

When laying mines on the ground surface using GMZ-2 minelayers, two minelayers are used. After laying, in order to obtain a step between mines in a row of 8 or 11*m*, the mines from each row laid by GMZ-2 are distributed through one into two rows with a distance between the rows of at least 10*m*. A detachment of sappers is assigned to distribute and transfer the mines to the combat position. The diagram of a four-row minefield and the actions of the crews are shown in Fig. 8.

When laying mines in the ground using two GMZ-2 minelayers, the installation of two-row minefields with a step of 5.5*m* is permitted as an exception.

To activate mines laid in the ground by PMZ-4 or GMZ-2 minelayers, two sappers are assigned to each row of mines. They move behind the minelayer, find the laid mines, use probes and measure the distances between the mines with steps. Having found the next mine, one of them manually moves the camouflage layer of turf (earth, snow) over the fuze, and the second removes the safety pin, presses the button and adjusts the camouflage.

To activate the mines laid out (and scattered) on the ground surface, one sapper is assigned to each row, who, moving behind, visually finds the mines, removes the safety pins and presses the buttons.

The installation of a minefield from TM-62 series mines manually and from vehicles using trays or by dropping is carried out in the same way as from TM-72 mines.

When laying a four-row minefield by a line crew using TM-62 series mines, each sapper carries and lays two mines at a time due to their heavy weight. Mines are laid out on the initial line at intervals of 5.5–6*m* (about 7–8 steps). The mines are switched to the combat position (pressing buttons) by sappers laying mines in the 2nd and 4th rows when the sappers who laid mines in the 1st and 3rd rows reach them during their retreat.

The handles removed from the mines, the wire pins and the safety clips are wrapped in a bag or placed in a box and buried in the ground at the minefield boundary. The location of the handles and safety pins is marked on the minefield plan in the form.

MINE DISPOSAL

Mines with MVN-72 fuzes, installed with the fuze camouflaged, as well as those that are damaged or in an unstable position, are PROHIBITED from being disarmed (removed).

In case of extreme necessity, it is permitted to defuse (remove) mines with MVN-72 fuzes installed without fuze camouflage. Mines are usually found by visual observation. In conditions of poor visibility (for example, when installing mines in thick grass), when visual detection of mines is difficult, it is permitted to use the IMP induction mine detector. Sappers who find mines and transfer them to the transport position must not have any ferromagnetic objects: weapons, shovels, helmets, knives, mine probes, pins, etc., and their shoes must not have steel shanks or nails. In summer, it is recommended to use rubber shoes, in winter- felt boots.

To remove a mine you need to:

- inspect the discovered mine without touching it, make sure that the mine is not damaged, there are no craters from shell explosions near it (closer than 1*m*), there are no metal objects (fragments) on top of the mine and the mine is in a stable position (otherwise it is prohibited to remove the mine, such a mine is destroyed at the place of installation);

— holding the mine fuze with your left hand so that the mine and fuze cannot move or turn, with your right hand lift the folding handle on the fuze to a vertical position and turn it clockwise (in the direction of the arrow on the fuze) until it stops, while the red button should rise up and a click will be heard (if the red button does not rise when the handle is turned, such a mine must not be removed, the mine is destroyed at the place of installation);

- turn the handle after the click in the opposite direction until it stops and fold it back to a horizontal position into the recess on the fuse body;

- place a safety clip under the button so that the pin latch fits onto the protrusion on the folding handle, and secure the clip with a wire pin (thin wire);
- remove the mine from the installation site and take it to the designated place.

To find mines and transfer them to the transport position, a crew of two soldiers are assigned to each row of mines. Soldier 1 finds the mines and transfers the fuzes to the transport position (winds the clock mechanism by turning the handle). **In order for soldier 2 to be able to distinguish mines transferred to the safe position, the handles are not turned back and are left in the vertical (raised) state.** Soldier 2, moving behind soldier 1, turns the handle back, lowers it to the horizontal position, installs the safety clips and secures them with wire pins, and then places the mine on its edge. A separate team of sappers is assigned to carry away mines transferred to the transport position.

When transferring mines to the transport position, it is prohibited to bring any steel objects to the mine or remove them from the mine. **The safety pin is installed only after the fuze has been transferred to the safe position.**

The removed mines are used for reinstallation. If necessary, the batteries are replaced.

Mines installed with camouflage are destroyed by trawling with an electromagnetic trawl if it is necessary to clear the area of mines.

It is prohibited to sweep mines with knife or roller trawls, as the mines may explode under the tank.

Mines can also be destroyed sequentially one by one by explosions of surface charges weighing (massing) at least 1 pound, primed non-electrically. The charges are placed on top of the camouflage layer or on the mine body next to the fuze, while the electric detonator for initiation must be located away from the fuze. It is permissible to use ZTP incendiary tubes with a friction igniter or those manufactured by the troops to detonate the charges.

The use of ZTP incendiary tubes with mechanical blasting caps made of steel is prohibited. It is also prohibited to remove the camouflage layer, since this may move the mine from its place or there may be fragments in the camouflage layer, the movement of which may lead to the mine being triggered.

Mines installed with camouflage are found when they are destroyed using the IMP mine detector. **It is prohibited to use a probe** (even a non-steel one) to specify the installation location of a mine that has been brought into combat position, since this may move the mine from its place, which may cause it to go off.

STORAGE AND TRANSPORTATION

TM-72 mines, MVN-72 fuzes without batteries and batteries for them are delivered to bases (warehouses) separately, in wooden boxes, in which they are stored and transported by all types of transport. The number of items in a box, the dimensions and weight (mass) of the boxes are given in Table 1.

Table 1

Name of products	**Quantity per box, pcs.**	**Dimensions of boxes, *mm***			**Weight (mass) of boxes with products, *kg***
		length	width	height	
Mines TM-72	4	712	330	350	40
Detonators MVN-72	24	530	520	426	38
Elements of KBU-1.5	480 (20 boxes of 24 pcs.)	424	296	152	-

The mine seal allows the placement of mines equipped with fuzes.

The fuses in the box (separately from the mines) are sealed in a polyethylene bag. The box with the fuses contains: a wrench for screwing the fuses into the mines; a key for unscrewing and screwing the plugs of the sockets for the batteries and 25 pcs. of KBU-1.5 batteries can be inserted (five boxes with 5 pcs. in each). For every 10 boxes, one pin is provided, which is fixed on the front wall and is used to pierce the polyethylene bags in case of transporting the fuses by air. The bag is pierced before loading onto the aircraft. Each box has a hole in the front wall for this purpose.

The packaging of the MVN-72 fuzes is shown in Fig. 9.

Temporary storage in military and field warehouses and transportation by road is permitted, in mine layers TM-72 and TM-62 series, equipped with MVN-72 fuzes, in the transport position (with safety pins secured with studs).

Standards for loading mines and detonators into vehicles are given in Table 2.

Parachute landing of TM-72 and TM-62 series mines equipped with MVN-72 fuzes is carried out in a mine crate.

When storing and transporting TM-72 mines and MVN-72 fuzes, follow these guidelines:

a) Order of the Minister of Defense of the USSR of 1962 No. 175;

b) Guidelines for Central, District (Naval) and Troop Depots of Engineering Ammunition of the Soviet Army and Navy (Voenizdat, 1964);

c) Instructions for Quality Control of Engineering Ammunition (Voenizdat, 1969).

Table 2.

Car brand	**Mines TM-72**		**Fuzes MVN-72**	
	Number of boxes, pcs.	Total min, pcs.	Number of boxes, pcs.	Total number of fuses, pcs.
GAZ-53	60	240	52	1248
GAZ-66	48	192	33	792
ZIL-130	66	264	52	1248
ZIL-131	81	324	44	956
Ural-375	70	280	52	1248

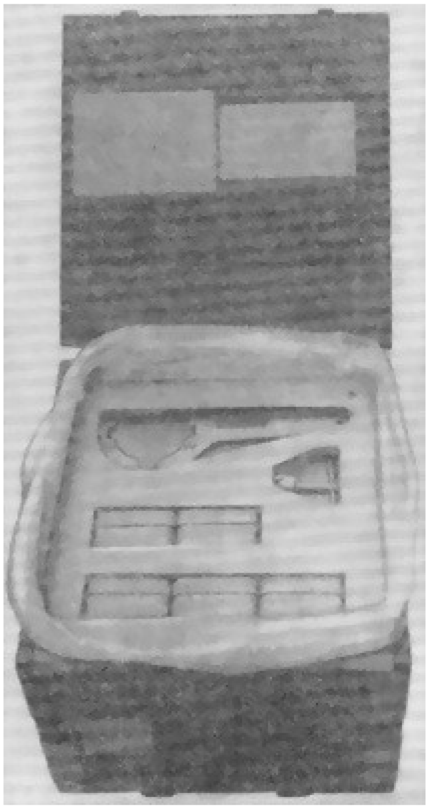

Fig. 9. Packaging of MVN-72 Mine Fuses

APPLICATIONS

APPENDIX 1

APPROXIMATE STANDARDS FOR INSTALLING MINEFIELDS FROM MINES OF TM-72 AND TM-62 SERIES WITH MVN-72 Mine Fuse

By a platoon of sappers manually in 1 hour

Installation method	**Type of mines**	
	TM-72, pcs.	TM-62, pcs.
Along the mine cord into the ground at night	80	70
In formation, during the day, into the ground	160	150

By a platoon of sappers from vehicles by dropping or using trays and barriers

Installation method	**Set min., pcs.**	**Time to install the kit, *min* ***	**Length of minefield, *m***
Mines TM-72			
From cars:			
to the ground surface	200×3	25-30	1600
with manual relocation into the ground	200×3	150-180	1600
Mines of the TM-62 series			
PMZ-4 barriers:			
into the ground	200×3	45-50	1600
to the ground surface	200×3	25-30	1600
GMZ-2 minelayers:			
into the ground (two-row field)	208×2	35-40	1140
to the ground surface (with manual distribution)	208×2	40-50	1140

* The time required to install the kit is determined by the time required to manually move the fuses into the combat position.

APPENDIX 2

PROBABILITY OF DAMAGE TO TANKS IN MINEFIELDS FROM MINES OF TM-72 AND TM-62 SERIES WITH MVN-72 FUSES

Characteristics of minefields	**Consumption min., pcs. per 1 *km***	**Probability of defeat**	
		TM-72 mines	TM-62 series mines
Three-row with a step of 8 *m*	375	0.62	0.78
Four-row with a step of 8 *m*	500	0.68	0.85
Four-row with a step of 11 *m*	364	0.58	0.74
Four-row with a step of 12 *m*	334	0.56	0.71
Double row with a step of 5.5 *m*	364	(Not recommended)	0.82

Notes

1

The fuze allows for the removal of mines installed without camouflage and their reinstallation by changing the batteries.